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WRAPPING MACHINE

TECHNICAL FIELD

5 The present invention relates to automatic packaging machines, and particularly the invention refers to a wrapping machine for wrapping chocolates, candies, sweets and similar products having different shape with different wrapping style.

BACKGROUND ART

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The known wrapping machines are provided with mobile or fixed folding members, which allow to carry out a single predefined wrapping style. It is possible to carry out a different wrapper, still belonging to the same wrapper typology, only by suitably replacing and/or modifying the folding members. Usually, said known machines do not allow to carry out
15 wrappers belonging to other wrapping styles. Typically a machine fit for carry out double twist wrappers can carry out, after changes, a single twist wrapper, but it is not able to carry out an envelope portfolio or a bunch wrapper.

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The main drawback of said known machines consists in the production rigidity that is in the restricted selection of wrapping styles, which can be carried out.

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Other drawback consists in that the replacement operations of the folding members, for adjusting the machine for a different wrapping style, are difficult and require long machine stops, with consequent interruption of production and increase of costs.

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There are modular wrapping machines that allow realizing several wrapping styles by assembling suitable folding modules to the basic structure of the machine.

The main drawback of said machines consists in that such flexibility is possible only during the production phase of the machine since the modules, once assembled to the machine, can not be disassembled and replaced in reasonable times, precluding the flexibility and versatility of the machine, once the latter is working at the production plant.

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Other drawback of the known wrapping machines consists in that it is impossible to modify or change the product outlet flow, according to the specific production demands.

It is known that in the wrapping machines for rectangular chocolates and similar products with traditional wrapping styles, the wrapping material must move parallelly to the product short side, which for stability demands is moved along a direction parallel to the product long side. For this reason said machines have a product feeding group, usually a belt or belts in cascade,
5 perpendicular to the wrapping material flow on the machine and thus to the machine main axis.

The main drawback of such machines is the position of the feeding group, which makes more difficult the access to the machine maintenance points positioned at the opposite sides with respect to said feeding group and preclude an operator to control at the same time two wrapping
10 machines, parallelly positioned.

There are also known wrapping machines for chocolates or similar products having a flat base, provided with of feeding groups including one or more storage belt, parallelly positioned with respect to the wrapping material flow of the machine. In this case, the aligned products in
15 mutual contact, due to the push of the queue, are moved to the picking zone, in which a pusher insert, one by one, the products into a feeding disk or into a positioning wheel, in order to rotate of 90° the products and to position them with the correct orientation at the following working station.

20 The main drawback of said feeding groups consists in that for high motion speeds the products tend to slip on the storage belt, causing an idle turn of the wrapping machine with consequent production and efficiency decrease.

Other drawback consists in that the stresses exerted on the products by the pusher and by the
25 feeding disk, in order to position the product in the following station, may cause damages of products, with possible detachments of splinters and portions thereof, which may dirt and/or obstruct the machine members.

DISCLOSURE OF THE INVENTION

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Object of the present invention is to propose a wrapping machine for wrapping chocolates or similar, which is fit to carry out completely different wrapping styles, allowing to pass in an easy and quick way from a wrapping style to others, without changes or difficult adjustment operations of the folding members.

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Other object of the present invention is to propose a machine, which can be integrated with a plurality of different feeding groups of known type, different groups according to the product to be wrapped, to their speed and to the wrapping style to perform on the product.

- 5 Further object is to propose a machine, which can have different configurations of the product outlet, in such way to satisfy the different plant demands of final user.

Other object of the present invention is to propose a wrapping machine provided with a feeding group which can operate at very high speeds, guaranteeing both a regular and reliable operation,
 10 without blockages, jams and product feeding lacks, and a delicate handling and/or moving of the product preserving it from damages.

The above-mentioned objects are achieved according to the claim contents.

15 BRIEF DESCRIPTION OF THE DRAWINGS

The characteristics of the present invention are underlined in the following with particular reference to the attached drawings, in which:

- figure 1 shows a front schematic view of the wrapping machine of the present invention;
- 20 - figure 2 shows a plan partial view of figure 1 machine;
- figure 3 shows an enlarged partial section front view of figure 1 machine;
- figure 4 shows an enlarged partial front view of a feeding group of figure 1 machine;
- figure 5 shows a plan view of the feeding group of figure 4;
- figure 6 shows a partial section view according to the plan VI-VI of figure 4;
- 25 - figure 7 shows a schematic perspective partial view of a variant of figure 1 machine, having a feeding group with storage belt, pusher and filling disk, in association with products in different wrapping steps;
- figure 8 shows a schematic perspective partial view of another variant of figure 1 machine having a feeding group with hopper and filling disk in association with products in different
 30 wrapping steps;
- figure 9 shows a schematic perspective partial view of a further variant of figure 1 machine characterized by a feeding group with slot belt in association with products in different wrapping steps.

35 BEST MODE OF CARRYING OUT THE INVENTION

With reference to figures 1 to 6, numeral 1 indicates a wrapping machine to enfold chocolates and similar products 100 by a wrapping material 101, substantially constituted by an unwinding and cutting group 6 of the wrapping material 101 and a feeding group 10 of the product 100.

- 5 The unwinding and cutting group 6 and the feeding group 10, feed an elevator group 5 respectively with a portion of wrapping material 101 and a respective product 100. The elevator group 5 provides the product 100, associated with the wrapping material 101, to a wrapping head 2 for mating a folding group 3 and for transferring the wrapped product 100 to an outlet group 7.

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The wrapping head 2, rotating on a horizontal axis, has eight gripper means 4 radially and angularly equidistant for gripping the product 100 and the wrapping material 101.

- 15 The folding group 3 is constituted by a plurality of folding modules, first 31, second 32 and third 33, which are positioned around the wrapping head 2 and are fit for folding borders of wrapping material 101 around the product 100 according to different wrapping styles.

- 20 The machine includes three seats first 45, second 46 and third 47, which are fixed around the wrapping head 2 in different positions, approximately in correspondence of sequential positions of the gripper means 4 of the wrapping head 2 in the stop steps. The seats are fit for alternatively and removably housing one of the folding modules, usually the third module 33, according to the required configuration of the machine 1.

- 25 The first folding module 31 includes a first folder means 40, of known type, which is mobile along a tangential direction with respect to the wrapping head 2, in order to fold a lower border of a wrapping material portion 101, in case a double twist or fancy wrapping style has to be carried out.

- 30 In alternative, the first folding module 31 includes second folder means 41, of known type, mutually facing and oscillating in a tangential direction with respect to the wrapping head 2 in order to fold side borders of wrapping material portion 101, pre-shaped by the passage through fixed folders during the product elevation, and to carry out an envelope portfolio wrapping style.

- 35 The second folding module 32 include folder means second 42 and third 43, of known type,

constituted by two couples of opposing folders, fit to carry out orthogonal and opposed folding of borders of a wrapping material portion 101 with envelope portfolio or fancy or bunch style.

5 The third folding module 33 includes a couple closing fingers 44 which realize the final double twist closing of a wrapping material 101.

The machine further includes first fixed folder means 80 which are interposed between the elevator group 5 and the wrapping head 2 and which, during the motion of respective product 100 by means of elevator group 5, provide to realize respective folding of wrapping material 101. Particularly, the first fixed folder means 80, according to their geometry and conformation, 10 execute a "H" shaped folding for an "envelope portfolio" wrapping style, or an upturned "U" shaped folding for a "double twist" wrapping style or a "hood" folding for a "bunch" wrapping style.

15 The machine 1 also include second fixed folder means 81 positioned close to the wrapping head 2 and fit to carry out suitable folding of wrapping material 101 on the product 100, during the transfer thereof from the first folding module 31 to the following modules 32, 33.

20 If the machine must carry out double twist or fancy wrapping styles for ovoid or spherical products, the second folder means execute the tubular closing of wrapping material 101, by folding the corresponding side edge.

25 It is important to underline that using different modules, separately or in combination, the machine can carry out wrappers 101 having very different wrapping styles. The time needed for the size change over, or rather the replacement of mobile and fixed folders, shaped according to the dimensions and/or type of product 100, is very easy and fast.

30 The first fixing seat 45 is approximately adjacent to the second folding module 32, while the second seat 46 is in position almost symmetrical to the first seat 45, with respect to a vertical plan passing through the rotating axis of wrapping head 2. The third seat 47 is interposed between the seats first 45 and second 46 and is approximately aligned to the vertical plan passing through the rotating axis of wrapping head 2.

35 By fixing the third folding module 33 to the first seat 45, the machine 1 can have an outlet group 7 of the product including removal means 35, of known type, which take each product

100 wrapped by the wrapping head 2 and transfer it to transport means 36, consisting for instance of a belt of known type, in order to orderly move outwards the products 100, according to a motion direction which is parallel to the feeding direction of products 100 in the feeding group 10 and which has the same sense.

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In case the outlet group 7 includes chute means 38, for the bulk exit of products 100, the third folding station 33 can be connected to the second seat 46 or to the third seat 47.

10 Particularly, by positioning the third folding module 33 at the third seat 47, it is possible having a double outlet group 7, constituted by removal 35 and transport 36 means, for products having "envelope portfolio", "fancy", "bunch" wrapping styles, and by following chute means 38 for double twist products.

15 If the removal means 35 and transport means 36 are not required but only the chute means 38 are requested, the third folding module 33 is fixed to the second seat 46.

20 The elevator group 5 includes articulated quadrilaterals 51, 52 of known type, connected to respective motorized cams and fit for moving a counter-elevator 50 and an elevator 53. The latter has side rests 59 for supporting side borders of wrapping material 101 and for avoiding that said borders can be bent because of the air resistance, while raising the product 100.

In the preferred embodiment, the machine 1 includes a feeding group 10 of product 100 substantially constituted by a first belt means 13, a second belt means 14, a third belt means 16 and a positioning wheel 9.

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30 The first belt means 13 has a continuous advance motion and supports and moves a plurality of products 100, aligned by a preceding alignment group, known and not shown, and arranged in a single line at mutual contact. The second belt means 14, which is aligned downstream the first belt means 13, has an alternate advance motion, in other words a periodical intermittent motion, and is associated with holding means 15 of product 100, which operate on the portion of said second belt means 14 on which the products 100 are positioned.

35 The third belt means 16, which is aligned and upstream to the first belt means 13, has a continuous advance motion, with a translation speed greater than the speed of first belt means 13 and realizes the product store.

The holding means 15 are constituted essentially by an air suction means 17 connected through a duct means 19 to at least an opening 18 carried out in the second belt means 14, in order to hold and to constrain through suction the products 100 to the second belt means 14.

- 5 The suction means 17 consists of a vacuum pump or a suction fan and the opening 18 may consist of a longitudinal slot, carried out by a couple of parallel and transversally spaced apart conveyor belts 22, which constitute the second belt means 14.

10 In alternative, the opening 18 may consist of a plurality of through holes carried out in the second belt means 14.

The duct means 19 have, for instance, an elongated delta shape, and are provide with a suction mouth 23, which has an elongated shape and is in flow communication with the opening 18. The suction mouth 23 is connected to the suction means 17, by means of an inner duct having
15 divergent shape starting from said suction mouth 23 up to the connection with said suction means 17.

The feeding group 10 includes two first sensor means 20 of minimum and maximum load, fit to sense the presence of products 100 on the first belt means 13 and particularly to measure the
20 respectively the minimum and maximum dimension of the storage queue of products 100 on said belt, in order to reduce or to increase the speed of the machine of wrapping machine and/or of the upstream product flow.

25 There are furthermore second sensor means 25, positioned close to the portion of second belt means 14 adjacent to the positioning wheel 9 and fit to sense the presence and the correct position of product 100 and consequently fit to define the operational steps between second belt means 14 and wheel 9.

30 The sensor means 20, 25 are of known type, such as optical type, for instance photocells or optical fibers, or inductive type.

The second belt means 14 is powered by an electric motor 21 of Brushless type, position, speed and acceleration controlled, in such a way to move according to predefined and programmable motion laws, while the belt means first 13 and third 16 are rotated by a ratio-motor 24.

The positioning wheel 9, rotating on a vertical axis and facing the second belt means 14 downstream the holding means 15, has four pliers means 11 angularly and equally spaced apart fit for grasping the product 100 from the second belt means 14. The pliers means 11 are positioned at 90° one with respect to the other and fixed to the wheel 9 with an orientation almost tangential to a geometric circumference inscribed in the positioning wheel 9 and concentric to the latter.

The positioning wheel 9 is substantially constituted by a first column 61, fixed to the machine 1 and rotatably supporting a second column 62 and a third column 63, coaxial thereto and independently rotating with respect to a vertical axis.

Each pliers means 11 is fixed, through a support plate 68, to the third column 63 and includes a couple of mobile tines 12, symmetrically rotating between a closing condition C, in which said tines 12 are at their minimum distance for grasping a product 100, to an opening condition D, in which they are at the maximum distance for releasing said product 100.

The opening and the closing of mobile tines 12 of each pliers means 11 is made through transmission means 65, connected to control means 64 of the second column 62 and moved by these last ones, by virtue of the partial alternate rotation of said second column 62.

Each transmission means 65 is essentially constituted by a pivot 67, which is slidably supported by the third column 63 and connected to the mobile tines 12 of the respective pliers means 11 through a pinion-rack connection. Furthermore the pivot 67 is slidably engaged, through sliding rolls 66, to a cam profile of control means 64.

The partial rotation of the cam profile causes the rising or descending translation of pivots 67 and, consequently respectively, the opening or closing rotation of mobile tines 12 of pliers means 11.

The wrapping machine is entirely controlled by calculation and control electronic means fit to control the phase relations between the feeding group 10, the sensor means 20, 25, the elevator group 5, the unwinding and cutting group 6, the wrapping head 2, the folding group 3 and the outlet group 7.

The operation of the wrapping machine 1 object of the present invention provides that the

folding modules 31, 32, 33 are independently activated in order to have different operational combinations for carrying out respective wrapping styles of wrapping material portion 101. For instance, by driving the folding modules, first 31 and second 32, in association with a fixed folder which operates, during the elevation stroke of the elevator, it is possible to carry out an envelope portfolio wrapping style, while driving the first folding module 31, having a first mobile folder 40, and driving the third folding module 33, it is possible to carry out a double twist wrapping material 101.

By positioning the fourth folding module 33, which can be connected to the first seat 45 or to the second seat 46, it is possible providing in different positions the wrapped product 100 to the outlet group 7.

The operation of feeding group 10 provides that the belt means third 16 and first 13 moves with uniform and continuous rectilinear motion the products 100 at different and decreasing speeds such to guarantee a storage queue of the products 100, controlled by minimum and maximum load sensor means 20, sufficient to feed without discontinuity the following the second belt means 14. The latter moves according to an alternate motion law, having a stroke equal to the product length to be moved and with a speed varying from a minimum value equal to zero to a maximum value, which is function of the machine cycle.

In the picking condition A of second belt means 14, while a product 100 is transferred from the first belt means 13 to the second belt means 14, another product 100, in a transfer condition T, is grasped by pliers 11 of the positioning wheel 9. By moving the second belt means 14 it is possible to progressively move the products 100 toward the positioning wheel 9. The gradual acceleration and deceleration of said belt means respectively at the start and at the end of the motion, allows to avoid the product slipping on said belt means and it allows, by virtue also of the particular layout of the pliers means 11 on the positioning wheel 2, the rotation of product 100, grasped by the pliers means 11, without interference with the following coming product.

In the moving conditions M of second belt means 14, in which the products are moved by the latter, the holding means 15 maintain each product 100 fixed to the belt means 14, cooperating in avoiding slipping phenomenon that could create gaps between the products, which can not filled anymore, or even collisions between the products.

The second belt means 14 is moved by an alternate motion and with motion law of

asymmetrical cycloidal type, with asymmetry ratio of 1,5, that is with a duration of the acceleration phase equal to $\frac{3}{4}$ of the whole cycle and a deceleration phase equal to $\frac{1}{4}$ of the cycle. Such law guarantees a smooth and slow moving of products 100 on the belt, to reduce the risks of possible slipping of products.

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During the operation of the machine, the positioning wheel 9 takes the product 100 from the second belt means 14 and moves it with alternated circular motion from the transfer condition T to a release condition R, in which the machine is motionless and the related pliers means 11 is opened for releasing the product 100 to the elevator group 5.

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A variant of the wrapping machine 1 object of the present invention includes an outlet group 7, shown with dashed lines in figure 1, in which the wrapped products 100 are moved according to a motion direction, which is parallel to the feeding direction of products in the feeding group 10, but with opposite sense.

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Another variant of the machine 1, schematically shown in figure 7, includes a feeding group 10 constituted by a storage belt 71, pusher means 72 and a feeding disk 73. The belt 71 has an alternate advance motion and transfers the products 100, aligned by a preceding storing system, known and not shown, to pusher means 72, which move each product 100 from said belt 71 to the disk 73. The latter has a plurality of slots, shaped for housing the products 100, and it rotates on a vertical axis to transport the products to the elevator group 5. Typically this type of feeding group is used in case of chocolates or the like, having a flat base.

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The machine further has an outlet group 7, essentially constituted by a chute 38 for bulk collecting of products 100.

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A further variant of the machine, schematically and partially shown in figure 8, includes a feeding group 10, constituted by a storage hopper 75 of products 100, which feeds a centrifugal filling disk 76, rotating on a vertical axis. The filling disk 76 has shaped seats 60 for accommodating the products 100 and for transporting them to the elevator group 5. Typically, this type of feeding group is used in case of chocolates or the like having spherical or ovoidal shape.

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The shown variant has an outlet group 7, in which the products 100 wrapped are moved according to a motion direction which is parallel to the unwinding direction of wrapping

material 101, with respect to which the products have concordant sense. In such outlet group, each product 100 wrapped is taken by the wrapping head 2 and transferred to transport and rolling means 36, of known type, which complete wrapper with “fancy” style.

- 5 The figure 9 shows another variant of the machine, in which the feeding group 10 includes a slot belt 77 having counter-dies 78 for accommodating respective products 100 and their transfer to the elevator group 5. The products 100 are picked from moulding dies through suitable devices of “pick-and-place” type, known and not shown, and transferred on the belt 77.
- 10 It is provided a further variant of the machine, not shown, in which the feeding group 10 is of combined type or rather it includes a storage belt 71 with pusher means 72 and feeding disk 73, to process products with flat base and a hopper 75 with centrifugal filling disk 76, in case of spherical or ovoidal products.
- 15 Such type of combined feeding group allows moving products 100 having any shape, with flat base or spherical/ovoidal.

The main advantage of the present invention is to provide a wrapping machine for wrapping chocolates, candies or similar products, which is fit to carry out completely different wrapping
20 styles, allowing easy and quick size change over operations for adjusting the machine for different wrapping styles.

Other advantage of the present invention is to provide a machine, which can be integrated with a plurality of different feeding groups of known type, according to the product to be wrapped, to
25 the required speed and to the wrapping style.

Further advantage is to provide a machine, which can have different configurations of the product outlet, in such way to satisfy the demands of final user.

- 30 Other advantage is to provide a wrapping machine with a feeding group, which can operate at very high speeds, with a regular and reliable operation, without blockages, jams and product feeding lacks, and having a delicate handling and moving thereof, preserving it from damages.